

### REMARKS

Claims 1-94 were pending as of the action mailed on August 12, 2008. Claims 1, 14, 26, 37, 48, 61, 73, and 84 are in independent form.

Claims 3, 5-6, 9-10, 12-13, 18-19, 26-27, 29, 33, 35-36, 41-42, 47, 50, 52-53, 56-57, 59-60, 65-66, 74, 76, 78, 83, 88-89, and 94 are being amended. No new matter has been added.

Reexamination of the application and reconsideration of the action are respectfully requested in light of the foregoing amendments and the following remarks.

### **Information Disclosure Statement**

Applicants are filing an Information Disclosure Statement with this reply, and would like to request that Examiner consider the references listed on an accompanying PTO-1449 form.

### **Drawings**

Applicants note Examiner's indication that the drawing sheets for Figs. 1-7D filed on January 28, 2004, are acceptable.

### **Interview Summary**

Applicants would like to thank Examiner Baron for his courtesy and professionalism in conducting an interview on August 4, 2008, after receiving a reply dated May 19, 2008. The following is a summary of the interview:

1. No exhibit or demonstration was conducted.
2. The pending § 102 rejection was discussed.
3. The general nature of claim 1 was discussed in the context of the reply dated May 19, 2008.
4. No other pertinent matters were discussed.

In addition, Applicants would like to thank Examiner Baron for his courtesy and professionalism in conducting a follow-up interview on August 5, 2008. The following is a summary of the interview:

1. No exhibit or demonstration was conducted.
2. The pending § 102 rejection was discussed.
3. The general nature of claim 1 was discussed in the context of the reply dated May 19, 2008.
4. No other pertinent matters were discussed.

### **Allowable Subject Matter**

Applicants note Examiner's acknowledgement that the prior art does not teach mapping a mapping permutation to a plurality of antennas for a plurality of adjacent tones. Applicants acknowledge that claims 13, 25, 36, 47, 60, 72, 83, and 94 would each be allowable if rewritten to include all of the limitations of the base claim and any intervening claims. In addition, Applicants reserve the right to rewrite claims 13, 25, 36, 47, 60, 72, 83, and 94 to include all of the limitations of the base claim and any intervening claims to be in allowable form.

### **Section 103 Rejections**

Claims 1-4, 14-17, 26-28, 37-40, 48-51, 61-64, 73-75, and 84-87 were rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over U.S. Patent No. 6,636,568 ("Kadous") in view of U.S. Patent Application Publication No. 2002/0122383 ("Wu"). Applicants believe that the rejection under "35 U.S.C. 102(e)" on page 4 of the Office Action mailed August 12, 2008 is a typographical error since the Office explicitly uses two separate references. Applicants respectfully traverse the rejections.

### **Claim 1 and its dependent claims**

Examiner stated that Kadous, in view of Wu, teaches the features of claim 1, and in particular, Examiner suggests that Wu teaches applying the plurality of mapping permutations in an alternating manner to map one or more of a plurality of data symbols to a plurality of antennas, for a plurality of data tones.

Examiner first stated that:

Wu teaches of a plurality of mapping in an alternating manner in teaching that OFDM systems were designed conventionally for either time diversity, one permutation, or for space diversity, a second permutation. Once data symbols are mapped to a set of antennas and tones in a time or space diversity permutation, the pattern is repeated in an alternating manner (see, for example, Wu Figure 2). (Page 2, Office Action mailed August 12, 2008)

In addition, Examiner stated that:

Kadous does not disclose a plurality of data tones, applying the plurality of mapping permutations in an alternating manner to map one or more of a plurality of data symbols to a plurality of antennas. (Page 4, Office Action mailed August 12, 2008)

Wu teaches of a plurality of data tones, applying the plurality of mapping permutations in an alternating manner to map one or more of a plurality of data symbols to a plurality of antennas. (1:[0015] ... . A space time transmitter diversity (STTD) system may be used on a MIMO structure i.e. applying the plurality of mapping permutations in an alternating manner ... . And 1:[0009] read Orthogonal frequency-domain multiplexing (OFDM) systems were designed conventionally for either time diversity or for space diversity, but not both i.e. applying the plurality of mapping permutations i.e. time diversity or for space diversity, to map one or more of a plurality of data symbols to a plurality of antennas. *Id.* (emphasis added)

Applicants note Examiner's acknowledgment that Kadous does not teach applying a plurality of mapping permutations in an alternating manner to map one or more of a plurality of data symbols to a plurality of antennas. Applicants further note that Examiner also does not assert that Kadous teaches or suggests applying a plurality of mapping permutations in an alternating manner to map a plurality of data symbols to a plurality of antennas, as was recited in claim 1. However, Applicants respectfully disagree with Examiner's assertion that Wu teaches this feature.

As an initial matter, Examiner has disregarded a portion of the language of claim 1 and has thus failed to address the claimed subject matter as a whole. Examiner fails to show a system that combined Kadous' teaching with those of Wu would result in, for a plurality of data tones, applying the plurality of mapping permutations in an alternating manner to map one or

more of a plurality of data symbols to a plurality of antennas, which is the feature the claim actually recites.

Applicants respectfully submit that claim 1 is allowable for at least this reason.

Furthermore, the passages cited by Examiner do not even teach applying the plurality of mapping permutations in an alternating manner to map one or more of a plurality of data symbols to a plurality of antennas, for a plurality of tones.

Claim 1 recites that a selected spatial multiplexing rate corresponds to the plurality of mapping permutations.

Wu's Fig. 2 only shows a schematic representation of a conventional orthogonal frequency-division multiplexing symbol. (Page 2, paragraph 27; Fig. 2). Furthermore, paragraphs 9 and 15 of Wu only describe conventional OFDM system designs (i.e., "[o]rthogonal frequency-domain multiplexing (OFDM) systems were designed conventionally for either time diversity or for space diversity" (Page 1, paragraph 9); "a transaction unit of a conventional OFDM signal is an OFDM frame that lasts 10 ms" (Page 1, paragraph 15)). Applicants respectfully submit that nothing in either Fig.2 or paragraphs 9 or 15 of Wu teaches or suggests a selected spatial multiplexing rate that corresponds to a plurality of mapping permutations.

In fact, Wu states that:

When sub-carriers use time diversity, it means that signal fading is strong so that parallel transmission of data packets can not be done ... . On the other hand, when sub-carriers use spatial diversity, signal fading is weak so that parallel transmissions may occur to increase the data rate capacity. (Page 2, paragraph 23) (emphasis added)

[T]he OFDM signals that are transmitted over multiple ones of the transmitters are independent of each other for spatial diversity and correspond to each other for the time diversity. (Page 7, claim 1) (emphasis added)

Applicants respectfully submit that Wu clearly states that, in Wu's system, signals transmitted using spatial diversity and signals transmitted using time diversity are not transmitted at a single rate (i.e., in time diversity, "parallel transmission of data packets can not be done"; in

spatial diversity, “signals that are transmitted over multiple ones of the transmitters are independent of each other”). Rather, the signals are transmitted at different rates, and not at a selected rate, let alone a selected spatial multiplexing rate.

Applicants respectfully submit that claim 1 is allowable for at least this additional reason.

In addition, Applicants respectfully submit that a spatial multiplexing rate is not even relevant in the context of time diversity. Therefore, Wu cannot disclose a plurality of mapping permutations, corresponding to a selected spatial multiplexing rate, that are applied in an alternating manner.

For at least these reasons, Applicants submit that claim 1 and its dependent claims are allowable.

#### **Claim 14 and its dependent claims**

Claim 14 is directed to a method and includes a plurality of mapping permutations applied in an alternating manner, where the plurality of mapping permutations correspond to a selected spatial multiplexing rate. For at least similar reasons as set forth above with respect to claim 1, claim 14 and its dependent claims are allowable over Kadous and Wu, alone or in combination.

#### **Claim 26 and its dependent claims**

Claim 26, as amended, is directed to an apparatus and includes applying a plurality of mapping permutations in an alternating manner, where a selected spatial multiplexing rate corresponds to the plurality of mapping permutations. For at least similar reasons as set forth above with respect to claim 1, claim 26 and its dependent claims are allowable over Kadous and Wu, alone or in combination.

#### **Claim 37 and its dependent claims**

Claim 37 is directed to an apparatus and includes a plurality of mapping permutations applied in an alternating manner, where the plurality of mapping permutations correspond to a selected spatial multiplexing rate. For at least similar reasons as set forth above with respect to

claim 1, claim 37 and its dependent claims are allowable over Kadous and Wu, alone or in combination.

**Claim 48 and its dependent claims**

Claim 48 is directed to a computer-readable medium and includes applying a plurality of mapping permutations in an alternating manner, where a spatial multiplexing rate corresponds to the plurality of mapping permutations. For at least similar reasons as set forth above with respect to claim 1, claim 48 and its dependent claims are allowable over Kadous and Wu, alone or in combination.

**Claim 61 and its dependent claims**

Claim 61 is directed to a computer-readable medium and includes a plurality of mapping permutations applied in an alternating manner, where the plurality of mapping permutations correspond to a selected spatial multiplexing rate. For at least similar reasons as set forth above with respect to claim 1, claim 61 and its dependent claims are allowable over Kadous and Wu, alone or in combination.

**Claim 73 and its dependent claims**

Claim 73, as amended, is directed to an apparatus and includes applying a plurality of mapping permutations in an alternating manner, where a selected spatial multiplexing rate corresponds to the plurality of mapping permutations. For at least similar reasons as set forth above with respect to claim 1, claim 73 and its dependent claims are allowable over Kadous and Wu, alone or in combination.

**Claim 84 and its dependent claims**

Claim 84 is directed to an apparatus and includes a plurality of mapping permutations applied in an alternating manner, where the plurality of mapping permutations correspond to a selected spatial multiplexing rate. For at least similar reasons as set forth above with respect to

claim 1, claim 84 and its dependent claims are allowable over Kadous and Wu, alone or in combination.

Claims 5-12, 18-24, 29-35, 41-46, 52-59, 65-71, 76-82, and 88-93 were rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Kadous in view of Wu, in further view of Gesbert, et al. From Theory to Practice: An Overview of MIMO Space-Time Coded Wireless Systems, IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, VOL. 21, NO. 3, APRIL 2003, and Rietz, College Algebra pages 186-187, Henry Holt and Company, 1909. Applicants respectfully traverse the rejections.

#### **Claims 5-12**

Claims 5-12 depend from claim 1. With respect to claim 1, Examiner does not assert, and neither Gesbert nor Reitz cure the deficiencies of Kadous or Wu. In particular, neither Gesbert nor Reitz teach or suggest applying a plurality of mapping permutations in an alternating manner to map one or more of a plurality of data symbols to a plurality of antennas, for a plurality of data tones, as recited by claim 1. Rather, Gesbert generally discloses mapping each symbol stream onto one of a multiple transmit antennas. (Page 282, Principles of Space-Time (MIMO) Systems, paragraph 1). And the portion of Rietz relied upon by Examiner only discloses an algebraic definition for combinations of things all different. (Page 187, Section 134).

Therefore, claims 5-12 are submitted to be allowable for at least the same reasons set forth above with respect to claim 1.

Claim 8 is separately allowable for at least the following additional reasons. Claim 8, as amended, recites that a plurality of mapping permutations are applied to a plurality of data tones in a cyclical manner. In the statement of rejection, the Examiner states that:

Wu teaches of at least two permutations i.e. space time transmitter diversity (STTD) and spatial multiplexing (SM). Further, in Wu teaches in Figure 3 of mapping these permutations cyclically across a set of tones (frequency) and antennas. Rietz teaches of an algebraic definition of

combinations of a subset of all things different when applied to a set of antenna and tones, where Wu's STTD and SM are two instances. Examiner argues that it would be obvious, as a function channel conditions (also taught by Wu, Abstract), to apply combinations of Rietz in a cyclical manner, as taught by Wu, for permutations between STTD and SM in order to optimize resources. (Page 3, Office Action mailed August 12, 2008)

Applicants respectfully disagree.

Applicants maintain the argument that Rietz only discloses the algebraic definition of combinations of all things different. Combinations do not teach or suggest applying permutations in a cyclical order. Rather, combinations ignore order. Rietz does not disclose applying a plurality of mapping permutations in a cyclical manner. Therefore, Kadous, Wu, Gesbert, and Rietz, alone or in combination do not teach or suggest the method of claim 8.

In fact, a portion of Wu relied upon by Examiner states that:

Sub-carriers are classified for spatial diversity transmission or for time diversity transmission based on the result of a comparison between threshold values and at least one of three criteria. The criteria includes a calculation of a smallest eigen value of a frequency channel response matrix and a smallest element of a diagonal of the matrix and a ratio of the largest and smallest eigen values of the matrix. (Abstract of Wu) (emphasis added)

Applicants respectfully assert that Wu clearly states that spatial diversity transmission or time diversity transmission is used based on independent comparisons for each sub-carrier. Even the types of transmissions, that Examiner alleges are mapping permutations, are not applied in a cyclical order. Therefore, Wu does not teach or suggest a plurality of mapping permutations that are applied to a plurality of data tones in a cyclical manner.

Applicants respectfully submit that claim 8, as amended, is allowable for at least this additional reason.

#### **Claims 18-24**

Claims 18-24 depend from claim 14 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 14.



Claim 21 is separately allowable for at least the following additional reasons. Claim 21, as amended, is directed to a method and includes a plurality of mapping permutations that are applied to a plurality of data tones in a cyclical manner. For at least similar reasons as set forth above with respect to claim 8, claim 21 is allowable over Kadous, Wu, Gesbert, and Rietz, alone or in combination.

#### **Claims 29-35**

Claims 29-35 depend from claim 26 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 26.

Claim 31 is separately allowable for at least the following additional reasons. Claim 31, as amended, is directed to an apparatus and includes a coding module that is operative to apply a plurality of mapping permutations to a plurality of data tones in a cyclical manner. For at least similar reasons as set forth above with respect to claim 8, claim 31 is allowable over Kadous, Wu, Gesbert, and Rietz, alone or in combination.

#### **Claims 41-46**

Claims 41-46 depend from claim 37 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 37.

Claim 44 is separately allowable for at least the following additional reasons. Claim 44, as amended, is directed to an apparatus and includes a plurality of mapping permutations that are applied to a plurality of data tones in a cyclical manner. For at least similar reasons as set forth above with respect to claim 8, claim 44 is allowable over Kadous, Wu, Gesbert, and Rietz, alone or in combination.

#### **Claims 52-59**

Claims 52-59 depend from claim 48 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 48.

Claim 55 is separately allowable for at least the following additional reasons. Claim 55, as amended, is directed to a computer-readable medium and includes a plurality of mapping permutations that are applied to a plurality of data tones in a cyclical manner. For at least similar reasons as set forth above with respect to claim 8, claim 55 is allowable over Kadous, Wu, Gesbert, and Rietz, alone or in combination.

#### **Claims 65-71**

Claims 65-71 depend from claim 61 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 61.

Claim 68 is separately allowable for at least the following additional reasons. Claim 68, as amended, is directed to a computer-readable medium and includes a plurality of mapping permutations that are applied to a plurality of data tones in a cyclical manner. For at least similar reasons as set forth above with respect to claim 8, claim 68 is allowable over Kadous, Wu, Gesbert, and Rietz, alone or in combination.

#### **Claims 76-82**

Claims 76-82 depend from claim 73 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 73.

Claim 78 is separately allowable for at least the following additional reasons. Claim 78, as amended, is directed to an apparatus and includes a coding module that is operative to apply a plurality of mapping permutations to a plurality of data tones in a cyclical manner. For at least similar reasons as set forth above with respect to claim 8, claim 78 is allowable over Kadous, Wu, Gesbert, and Rietz, alone or in combination.

#### **Claims 88-93**

Claims 88-93 depend from claim 84 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 84.

Claim 91 is separately allowable for at least the following additional reasons. Claim 91, as amended, is directed to an apparatus and includes a plurality of mapping permutations that are applied to a plurality of data tones in a cyclical manner. For at least similar reasons as set forth above with respect to claim 8, claim 91 is allowable over Kadous, Wu, Gesbert, and Rietz, alone or in combination.

### **Conclusion**

By responding in the foregoing remarks only to particular positions taken by Examiner, Applicants do not acquiesce with other positions that have not been explicitly addressed. In addition, Applicants' arguments for the patentability of a claim should not be understood as implying that no other reasons for the patentability of that claim exist.

Applicants respectfully request that all pending claims be allowed. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: November 12, 2008

/William E. Hunter/

William E. Hunter  
Reg. No. 47,671

**PTO Customer No. 26200**

Fish & Richardson P.C.

Telephone: (650) 839-5070

Facsimile: (877) 769-7945